

CEMENT PAINT

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THIS INVENTION relates, broadly, to a cement paint. More particularly, it relates to a water-based cement paint; and it relates to a process for formulating the water-based cement paint.

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According to the invention there is provided a water-based cement paint which includes, as constituents thereof, cement particles and water, the cement particles being uncured cement particles, the paint also including, as a constituent, colloidally-sized particles of polymeric material capable of forming a stable colloid in water, the paint being in the form of a homogeneous blend of said constituents, the cement particles forming 5 - 40% by mass of the paint and the colloidally-sized particles forming 0.25 - 10% by mass of the paint.

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It is a feature of the paint of the present invention that the paint can be formulated as a stable blend of its constituents, in that the blend has an extended shelf-life in the absence of air. By stable is meant not only that the blend has said extended shelf-life in the absence of air, but also that it has little or no tendency, when sealed in a paint can, to separate quickly into its constituent parts, and after mixing by stirring in a paint can prior to use, will not require further mixing for at least 60 minutes. By an extended shelf-life is meant that the paint, in the absence of air (for example when contained in a sealed paint can), will be usable for several months

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or more, requiring no more than stirring to provide it with acceptable homogeneity prior to use.

5 The uncured cement particles are capable of being cured, i.e. in this context being capable in bulk of setting and hardening into a mass, by contact with water and are conveniently run-of-the-mill portland cement particles, which may be of white or grey portland cement, depending on the intended colour of the paint and on any pigment used in the paint. The ordinary particle size of uncured portland cement
10 is suitable for the present invention; and the cement particles may form 10 – 30% by mass of the paint, preferably 12 – 18% by mass of the paint.

 The colloiddally-sized polymeric particles will have a particle size in the range 1 – 100nm and, as indicated above, will be capable of forming a stable
15 colloidal suspension in water. Suitable colloiddally-sized particles may be fibrous in shape, being elongated and typically having a length at least several time their maximum transverse dimension. The colloiddally-sized particles may be of a material selected from the group of polymeric materials consisting of sodium carboxymethyl-cellulose, hydroxyethyl-cellulose, carboxymethyl-cellulose, polyvinyl-alcohol and
20 mixtures thereof. Preferably the colloiddally-sized polymeric particles are of sodium carboxymethyl -cellulose. The polymeric particles may form 1 - 6% by mass of the paint, preferably 1.5 – 3% by mass of the paint.

 In a particular embodiment of the invention, the cement particles may
25 be run-of-the-mill portland cement particles, the cement particles forming 10 - 30% by

mass of the paint and the colloidally-sized particles forming 1 - 6% by mass of the paint. In a more preferred embodiment they form respectively 12 - 18% and 1.5 - 3% by mass. As indicated above, the cement particles may be grey portland cement particles, or, instead, the cement particles may be white portland cement particles.

Without being bound by theory, the Applicant believes that the colloidally-sized particles act by adhering in the paint blend to the surfaces of the cement particles, to form a sufficiently continuous coating thereon to protect the cement particles from water in the blend and to resist or prevent premature or so-called in-can curing of the cement in the blend. Too low a proportion of the polymeric particles is expected to result in premature or in-can curing of the cement, while too high a proportion can adversely affect early water resistance of the paint, when it has been applied to provide a painted layer on a substrate, and can also adversely affect curing of the cement in the layer on the substrate. Routine experimentation will thus be required to determine, as with the cement proportions, acceptable or optimum proportions of the polymeric particles in the paint.

As indicated above, the particles may be fibrous in shape, i.e. they may have a shape which resembles that of fibres, so that they are indeed in the form of fibres; and a particularly preferred embodiment the polymeric material is sodium carboxymethyl cellulose.

The paint may include a particulate elastomer. In particular, the elastomer may be capable of curing on exposure to the atmosphere when forming

part of a paint layer painted on a substrate, to provide the paint layer with early or short-term film strength, desirable flexibility and sheen, durability and ease of application. The elastomer is desirably also be capable of providing, when cured, resistance to water penetration through the layer into the substrate, the resistance lasting at least until the curing of the cement in the paint reaches a sufficient stage to take over from the elastomer in providing the paint layer with these properties on a long-term basis. Suitable elastomers may be selected from the group of elastomeric materials consisting of latex, synthetic rubber, styrene, butadiene and mixtures thereof, latex being preferred. When the elastomer is a latex, it may form 5 – 60% by mass of the paint, preferably 20 – 50%. The average particle size of the latex may be in the range 0.08 – 1 μ m, preferably 0.1 – 0.7 μ m, all the particles conveniently falling in these size ranges. As with the cement and colloiddally-sized polymeric particles, routine experimentation can also be used to establish acceptable or optimum proportions and particle sizes for the elastomer particles in the paint blend. The Applicant has successfully used both pure acrylic latexes and styrene-acrylic latexes.

Accordingly, the paint may include, as a constituent thereof, an uncured particulate elastomer capable of curing upon exposure to the atmosphere. The elastomer may, in particular, be a latex forming 5 – 60% by mass of the paint, and having an average particle size in the range 0.08 – 1 μ m; and in a preferred version of the paint, the latex may form 20 – 50% by mass of the paint, the paint having a particle size in the range 0.1 – 0.7 μ m.

Optionally, the paint includes a thickener. The thickener may be any suitable commercially available thickener, used in appropriate or manufacturer's recommended proportions to obtain a desired degree of thickening of the paint blend.

- 5 The Applicant has found that, in general, hydroxyalkyl-celluloses are suitable for this purpose, examples being hydroxyethyl-cellulose, methyl hydroxyethyl-cellulose, ethyl hydroxyethyl-cellulose, methyl hydroxypropyl-cellulose, or the like. The thickener can desirably affect the application properties of the paint, can inhibit separation of constituents of the blend from one another in the can and settling
- 10 therein of solids, and can generally provide good stability and extended shelf-life. A preferred version of the paint includes 0.1 – 0.6% by mass of a hydroxyalkyl-cellulose thickener.

- Furthermore, the paint optionally includes a suitable pigment, to provide
- 15 it with a desired colour and/or opacity. While the proportion of pigment used can vary widely, a proportion of 1 – 15% by mass has been found to be suitable. Inorganic pigments such as oxides, in particular metal oxides, are preferred, as being compatible with the cement in the paint, the pigments being typically present in proportions forming 2 – 10% by mass of the paint, preferably 3 – 5%, and having an
- 20 average particle size of 0.05 – 100µm, preferably 1 – 20µm, all the pigment particles conveniently falling in these size ranges. It follows that the paint may include 1 – 15% by mass of a pigment; and in particular the pigment may be a particulate inorganic pigment forming 2 – 10% by mass of the paint and having an average particle size in the range 0.05 – 100 µm.

The paint may include, as optional constituents, one or more suitable in-can biocides, one or more dry-film fungicides and/or algicides, one or more defoamers and one or more dispersants. Commercially available products may be used for these purposes, in the usual proportions prescribed by the manufacturers. The Applicant has successfully used, as formaldehyde-releasing biocidal agents, in-can biocides selected from methyl-isothiazalone, chloromethyl-isothiazalone, benzyl-isothiazalone and suitable mixtures thereof. In paints according to the present invention, the Applicant has used 0.1 – 0.3% by mass of said formaldehyde-releasing agents to resist microbiological attack on the colloidally-sized polymeric particles in the can, together with 0.05 – 1%, preferably 0.5 – 1%, by mass dry-film fungicide and/or algicide, and with 0.05 – 0.5%, preferably 0.1 - 0.4%, by mass defoamer and 0.05 – 0.5% by mass dispersant.

As with the cement, polymeric material and elastomer, routine experimentation can be employed, both for the selection of the various said optional constituents and for selection of their proportions in the paint, bearing in mind both technical and economic considerations, for optimum or at least acceptable results. Typically, once the proportions of all the constituents have been established, water will make up the balance.

To formulate the paint blend the colloidally-sized polymer particles may be dispersed in water to form a colloidal suspension of the particles therein, the cement then being admixed into the colloidal suspension, followed optionally by the particulate elastomer. Conveniently, any in-can biocide, fungicide/algicide and/or

defoamer used is admixed with the water or colloidal suspension prior to the cement, and any pigment, thickener and/or dispersant used is admixed with the other constituents, after addition of the elastomer to the colloidal suspension. In particular, 5 the pigment, thickener and/or dispersant may be dispersed (dissolved and/or suspended) in water before addition thereof to the blend of the other constituents.

The invention accordingly extends to a process for formulating a water-based cement paint as defined above, the process including the steps of:

10 suspending the colloidally-sized polymer particles in water to form a colloidal suspension; and

admixing the cement particles with the colloidal suspension to form a blend of the water, cement and colloidally-sized polymer particles.

15 The process may include the step of admixing the elastomer particles with the water to form the colloidal suspension, before the admixing of the cement particles with the suspension.

The various other said optional constituents may be admixed with the 20 water, polymer particles, cement particles and elastomer particles in any desired or convenient sequence.

The invention will now be described, by way of non-limiting illustrative example, with reference to the following worked Examples:

EXAMPLE 1

In an initial trial a batch comprising 182 kg (178ℓ) of a colloidal suspension was prepared by admixing, into 160ℓ water, 12 kg of colloidally-sized cellulose fibres, 5 kg of in-can biocide, 5 kg of defoamer, and 10ℓ of acrylic latex available under the Trade Mark "REV 6115" from Revertex Chemicals (Proprietary) Limited of 200 Lansdowne Road, Jacobs, Durban, Republic of South Africa. The cellulose fibres were those available under the Trade Mark "NORILOSE 6064" from Protea Chemicals Limited of 1 Berrange Road, Wadeville, Gauteng, Republic of South Africa; the biocide was that available under the Trade Mark "ROCIMA 623N" from (ACIMA) Servochem (Proprietary) Limited of 8 Struwig Street, Jet Park, Republic of South Africa; and the defoamer was that available under the Trade Mark "DEFOAMER-AF306" from Servochem.

To 178ℓ of the colloidal suspension was added 100 kg of ordinary white portland cement available from Lafarge South Africa (Proprietary) Limited of Century Club Estates, 21 Woodlands Drive, Woodmead, Gauteng, Republic of South Africa to obtain about 270 kg of a blend of the cement and the colloidal suspension.

To the cement-containing blend were added a further 230ℓ of the "REV 6115" acrylic latex, to form a water-based cement paint according to the invention.

Finally, additional optional constituents were added to the paint, namely 100ℓ water into which was admixed 30 kg of titanium dioxide pigment having a particle size in the range 1 - 20µm to form a pigment suspension, together with 1.6 kg of hydroxyethyl-cellulose available from Dow/Servochem under the Trade Mark "CELLOSIZE QP52000" and 0.2 kg of dispersant available from Rohm and Haas/Servochem under the Trade Mark "OROTAN N4000". This made up a batch of paint having a mass of 617 – 631 kg and a volume of 570 – 580ℓ.

To form the colloidal suspension the biocide, defoamer and cellulose fibres were added slowly to the water with medium-speed stirring, the stirring being continued for 10 minutes after the addition was complete. The suspension was left to digest without stirring for an hour, after which the acrylic latex was added over 5 minutes with medium-speed stirring.

To obtain the cement-containing blend, the cement was added slowly to the colloidal suspension with mixing by medium-speed stirring, after which the mixing was continued for a further 10 minutes to obtain a paste, which was left to digest overnight.

The remaining acrylic latex was added, after the digestion overnight, to the paste slowly with mixing by medium-speed stirring, which continued for 15 minutes after the addition was complete, to obtain the paint.

The pigment suspension was made by adding the thickener slowly to the water with medium-speed stirring, after which the stirring was continued for 10 minutes. The pigment was then admixed into the water containing the thickener over a period of 15 - 25 minutes with medium-speed stirring.

Finally, the pigment suspension was added to the paint with mixing over a period of 5 minutes by means of medium-speed stirring to colour the paint.

EXAMPLE 2

In a subsequent trial Example 1 was repeated except that the "REV 6115" latex was replaced by the same mass of the latex available from Servochem under the Trade Mark "PRIMAL SF-016"; and the white portland cement was replaced by the same mass of ordinary grey portland cement, also obtained from Lafarge South Africa (Proprietary) Limited. The titanium dioxide pigment was omitted, the batch sizes and volumes being reduced to 587 – 601 kg and 500 – 510ℓ respectively.

EXAMPLE 3

In another subsequent trial Example 1 was repeated except that the white portland cement was replaced by the same mass of ordinary grey portland cement from the same supplier; and the titanium dioxide pigment was

replaced by the same mass of red iron (ferrous) oxide pigment of the same particle size.

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EXAMPLE 4

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In a further subsequent trial Example 1 was repeated except that the "NORIOSE 6064" cellulose fibres admixed into the 160ℓ water were increased from 12 kg to 18 kg; and the "REV 6115" latex was replaced by the same mass of "PRIMAL SF-016" latex.

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The initial trial of the present invention as illustrated by Example 1 showed substantial increases in in-can shelf-life, compared with a control which had the same composition except that it omitted the colloidally-sized cellulose fibres, and promised to render feasible provision of a water-based cement paint which is in single-pack form and can be stored for a substantial shelf-life of several months or more in a paint tin or paint can. Such paint would be useful for coating substrates, in particular cementitious substrates, for both waterproofing and colouring purposes.

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The subsequent trials detailed in Examples 2 - 4 provided paints which lived up to the promise of Example 1 in that they embodied the advances promised by Example 1, and exhibited (Examples 2 and 3), or promise to exhibit (Example 4) said long shelf-lives. The paint can be used without frequent stirring after the can has been opened and cures rapidly by virtue of its acrylic latex content, nevertheless continuing to cure for long-term utility by virtue of its cement content. The cement

content also bonds with cement in cement-containing substrates to which the paint is often expected to be applied, the cement curing and bonding after application thereof to the substrate.